2. Two blunt hooks, with the hook straight, $\frac{1}{4}$ inch in length, extending at a right angle from the handle, having a diameter scarcely larger than a carpet needle. The end of the hook is slightly bulbous. A considerable part of the dissection is performed by the blunt hooks which are used in tearing the connective tissue.

3. Three artery clamps, by which bleeding vessels or oozing surfaces are seized, and the instruments with their points attached to the bleeding surface are dropped upon the sides of the neck. They thus aid in drawing open the wound.

4. Tenacula. Two with hooks in line with the handle; two others with hooks at right angle to the handle; the diameter of the curves in the hooks $\frac{1}{4}$ inch. Those with hooks at right angles are employed for transfixing and holding the trachea when it is to be opened.

5. Two grooved directors, one with the end smaller and more pointed than that of the other.

6. A common artery forceps, also forceps with fine teeth.

7. The spring hook of the oculist, employed by him in separating the eyelids; it holds apart the edges of the wound.

8. The tracheotomy tube consisting of two concentric cylinders, described above.

9. Pigeon's quills; these are important for removing muco-pus and fibrinous shreds from the trachea and bronchial tubes. An instance has come to my knowledge in which the physician who assumed charge of the case after the operation attempted to use for this purpose a small piece of sponge held by forceps; he unfortunately loosened his hold, the sponge was drawn in with the breath and immediate death by suffocation resulted. This would not have happened with the pigeon's quill.

Dr. Lange does not stitch the wound by the side of the canula, but leaving it open, dusts upon it iodoform, applies over the iodoform two thicknesses of linen soaked in a bichloride of mercury solution, one part to two thousand, and notched so as to surround and pass under the plate of the canula. The linen is covered by India-rubber gauze. Every hour the linen is moistened by the bichloride solution.

ARTICLE II.

A STATISTICAL REVIEW OF THE OPERATIVE MEASURES DEVISED FOR THE RELIEF OF PYLORIC STENOSIS.

By RANDOLPH WINSLOW, M.A., M.D., Demonstrator of Anatomy in the University of Maryland, and Professor of Surgery in the Woman's Medical College of Baltimore; Surgeon to University and Bay View Hospitals, Baltimore.

BUT few of the ills to which humanity has fallen heir are attended with more distressing symptoms than those produced by stenosis of the pyloric orifice, from any cause whatever, and in but few has the prognosis been so absolutely hopeless. Until within the past six years the condition was regarded as beyond the domain of surgical interference, and with the diagnosis, "stenosis of the pylorus," the fate of the patient was irrevocably sealed.

The *early history* of cancer and other affections of this portion of the alimentary tract presents so many features in common, that it is usually impossible to form a correct diagnosis until the narrowing of the lumen of the pylorus has progressed to a degree sufficient to interfere with the passage of the contents of the stomach into the duodenum, or until a perceptible tumor is discovered; even then many elements of uncertainty may be present.

The *cause* of pyloric obstruction in the vast majority of cases is carcinoma, but the cicatrization of gastric ulcers, and the thickening of the walls in consequence, are occasionally sufficient completely to close the orifice.

Symptoms.—In most cases of stenosis of the pylorus a tumor can be discerned in the epigastric or right hypochondriac region, even in those due to simple round ulcer, but sometimes the symptoms of coarctation are very decided, and no tumor can be felt. It may be situated under cover of the liver, and beyond external exploration. In other cases the tumor is displaced to the level of the umbilicus, or even as low as the pelvis, giving upon superficial examination the impression that the growth is in the great omentum or mesentery. The usual symptoms of pyloric obstruction are uncontrollable vomiting of the contents of the stomach, without bile, which are sour, offensive, and often contain a sediment resembling coffee-grounds. Gastric distress frequently amounting to severe pain is often experienced, or a sensation of dragging or tearing. The stools become more and more scant, and occur at long intervals. With these symptoms ectasis of the stomach will often be discovered upon careful percussion, or by means of inflating the viscus with Seidlitz powder, which is made to effervesce within its cavity, or the same can be seen by introducing a tube and filling the stomach with water.

Diagnosis.—When symptoms of indigestion have been long in existence, until finally the pain and vomiting have become habitual; when a tumor is detected in the pyloric region with which the stomach seems to be connected; and when this organ is found to be dilated by some of the methods mentioned above, the diagnosis is almost certain, but with these symptoms mistakes have been made. Billroth[1] upon one occasion made an incision for the purpose of performing pylorectomy, and found the trouble to be a wandering kidney, which he removed. Lauenstein,[2] on the contrary, performed laparotomy for the removal of a supposed floating kidney, and found he had to deal with a cicatricial contraction of the pylorus. Amongst other corroborative signs of carcinoma of the pylorus is the fact first observed by Van den Velden, and substantiated by Czerny,[1] that free hydrochloric acid is not found in the stomach when malignant disease of this opening is present. Mikulicz,[2] the inventor of the gastroscope, advocates the use of this instrument for diagnostic purposes. He says, when the pylorus is not stenosed, regular rhythmical motions can be seen to occur, but when it is the seat of cancer, these movements will be absent. Whilst ocular inspection of the stomach is certainly desirable, the gastroscope is too complicated and too expensive ever to be available for general use.

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[1] Wien. Med. Wochenschrift, 1884, No. 27.

[2] Arkiv für Klin. Chirurg., Bd. xxviii.

Prognosis.—Internal medicine offers absolutely no hope to the unfortunate sufferer from pyloric stenosis, and until recently he was doomed to die wretchedly from starvation. More than seventy years ago Dr. C. T. Merrem[3] proved beyond question, by experiments upon dogs, that large portions of the stomachs of these animals could be excised without necessarily causing death, and in a published dissertation earnestly advocated the propriety of the operation upon man in appropriate cases. His suggestion met with no acceptance from his contemporaries, and he did not live long enough to see his views put to the test of practice. It remained for a future generation, guarded by the potent influences of antiseptic surgery, to accept his doctrines, and venture upon removal of portions of the human stomach. It must not be supposed, however, that gastrectomy has been undertaken in our day without careful experimentation upon animals and the cadaver, aided by observations upon man in analogous conditions of the intestines, and accurately recorded reports of post-mortem examinations of the conditions found in carcinoma of the pylorus.

Pylorectomy is a matter of gradual development, and certain preparatory stages were required before the operation was considered justifiable in man. First in importance in proving the feasibility of this operation has been experimentation upon animals, beginning with simple circular resection of the intestines, and ending with the almost complete removal of the stomach and the suturing of the cardiac and pyloric extremities together, which was successfully done by Kaiser and Werth[4] upon a dog, the animal not only having been none the worse for this mutilation, but actually gained flesh, and was killed six years subsequently, a martyr to science.[5] Circular resection of the human intestines for gangrene caused by hernia, as practised by Czerny and others, naturally attracted profound attention, and the discovery of the important fact that peritoneal surfaces must be brought flatly together in order to obtain union, and the adaptation of the invaginating suture of Lembert or Gély, and the tier suture of Czerny have aided largely in rendering operative procedures upon the stomach possible.

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[1] Wien. Med. Wochens., 1884, No. 17.

[2] Wien. Med. Wochens., 1883, p. 705.

[3] Inaugural Dissertation. See Rydygier's Lecture, Volkmann's Sammlung, No. 220.

[4] Rydygier's Lecture, Volkmann's Sammlung, 220.

[5] See Archiv f. Klin. Chirurg., 1884, Band xxx. Heft 1.

Six operations have been practised for the relief of stenosis of the pylorus: 1st. Pylorectomy; 2d. Gastro-enterostomy; 3d. Gastrectomy; 4th. Gastrostomy; 5th. Duodenostomy; 6th. Digital divulsion of the pylorus.

PYLORECTOMY.—As previously stated, no operative treatment was ventured upon for the relief of pyloric disease until April 9, 1879, when Péan, of Paris, at the urgent request of the patient, who threatened to commit suicide unless relieved of his sufferings, performed laparotomy and removed a cancerous tumor of the pylorus, and by so doing ushered in a new era in abdominal surgery. His patient, a man, died on the fifth day of inanition. This operation attracted but little favorable notice, and was regarded more in the light of a surgical audacity than as an advance in the domain of legitimate surgery. His example was followed by Rydygier, of Kulm, on November 16, 1880, and his patient succumbed to collapse in twelve hours. On the 29th of January, 1881, Prof. Billroth, of Vienna, performed the third pylorectomy upon Frau Maria Theresia Heller, who was dying from starvation, the result of pyloric stenosis. The patient made a speedy recovery from the operation, gained flesh rapidly, and returned to her accustomed mode of life. She died from recurrence of the disease four months subsequently. The news of this operation spread with wonderful rapidity, and its successful issue was hailed as a great surgical triumph. The surgeons of Vienna especially greeted the great event with the liveliest expressions of joy and admiration. They called it an epoch-making operation.

Statistics.—Up to the present time pylorectomy has been performed over sixty times, in various quarters of the globe, and although this number is insufficient for determining the true value of the method, the indications for and against its performance, its technique, and its final results, still it is believed that valuable data may be gleaned from its statistics, meagre though they be. The following table[1] is believed to contain all the recorded pylorectomies which have been reported to date. In almost all of them the original publications have been examined, with the exception of those published in the Norwegian, Dutch, Polish, and Russian languages, in which cases abstracts in the German and American journals have been relied upon:—

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[1] For previous statistics see Rydygier's Lecture, Volkmann's Sammlung, No. 220; Kahn's tables in Bulletin Gén. de Thérap., tome civ. p. 216; and Krönlein's tables in Correspondenzblatt für Schweizer Aerzte, July 15, 1882.

Statistical Summary of all Cases of Resection of the Pylorus recorded to February 1, 1885.

No.	Operator.	Residence.	Date.	Sex.	Age.	Disease.	Length of operation. Hours.	Result.	Cause of death.	Remarks.	Reference.
1	Péan	Paris	1879 April 9	M.	?	Carcinoma	2½	Death on 5th day	Inanition	....	Wien. Med. Blätter, 1881, No. 7. Lancet, June 7, 1879.
2	Rydygier	Kulm	1880 Nov. 16	M.	64	Carcinoma (scirrhus)	4	Death in 12 hours	Collapse	....	Deutsche Zeitschrift für Chirurgie, 1881, p. 253.
3	Billroth	Vienna	1881 Jan. 29	F.	43	Carcinoma (colloid)	1½	Recovery	....	Died in four months from recurrence.	Wien. Med. Presse, 1881, p. 205.
4	Billroth	Vienna	1881 Feb. 28	F.	39	Carcinoma (epithelial)	3	Death in 8 days	Inanition	A diverticulum formed at the greater curvature.	Wien. Med. Presse, 1881, p. 338.
5	Billroth	Vienna	1881 Mar. 12	F.	38	Carcinoma (medullary)	2½	Death in 12 hours	Collapse	Reported by Mikulicz.	Deutsche Med. Wochenschrift, 1881, p. 353.
6	Nicolaysen	Christianna	1881 Mar. 17	F.	37	Carcinoma (epithelial)	2½	Death in 15 hours	Collapse	Originally published in Nordisk Med. Ark., xiii. No. 27.	Trans. Internat. Med. Cong., 1881 (see article by Czerny).
7	Bardenheuer	Cologne	1881 Mar. 18	F.	54	Carcinoma	?	Death in 26 hours	Collapse	Much blood was found in stomach at autopsy.	Rydygier's Statistics in Volkmann's Sammlung, No. 220.
8	Woelfler	Vienna	1881 April 8	F.	52	Carcinoma (colloid)	?	Recovery	....	Alive Jan. 1885, but has glandular enlargements in right groin.	Wien. Med. Wochen., 1882, p. 407; also in Woelfler's Book.
9	Berns	Utrecht	1881 April	F.	49	Carcinoma	Very tedious	Death in 4 hours	Collapse	Portion of pancreas ligated; vena cava exposed.	Wien. Med. Wochens., 1881, p. 1405.
10	Tillmans	Leipzig	1881 May 13	M.	63	Carcinoma	?	Death in 3 hours	Collapse	....	Berlin. klin. Wochens., 1882, No. 34.
11	Jurié	Vienna	1881 end of May	F.	54	Carcinoma	?	Death in 24 hours	Collapse	....	Wien. Med. Wochens., 1881, No. 23.
12	Krönlein	Zurich	1881 June 4	F.	54	Carcinoma	3	Death in 24 hours	Collapse	Many adhesions.	Corresp. blatt. für Schweiz Aerzte, 1882, p. 466.
13	Czerny	Heidelberg	1881 June 21	M.	28	Colloid	2¼	Recovery	....	Died Jan. 5, 1883.	Wien. Med. Wochens., 1884, No. 17.
14	Lücke	Strassburg	1881 June 25	M.	33	Scirrhus	5	Death in 10 hours	Collapse	Adherent to pancreas.	Deutsch. Zeitschrift f. Chirg., xvi. p. 260.
15	Kocher	Berne	1881 June 28	M.	42	Carcinoma	4	Death in 24 hours	Collapse	....	Corresp. Blatt. f. Schw. Aerzte, Dec. 1, 1883.
16	Kitajewsky	Russia	1881 July 16	F.	52	Carcinoma	4	Death in 6 hours	Collapse	Originally published in Medecinsk Obosrenije.	Centralblatt für Chirg., 1881, p. 783.
17	Weinlechner	Vienna	1881 Aug. 18	M.	47	Carcinoma	5	Death in 5 hours	Collapse	Many adhesions to pancreas and liver.	Centralblatt für Chirg., 1882, p. 349.
18	Billroth	Vienna	1881 Oct. 33	F.	36	Carcinoma (glandular epithelial)	1¼	Recovery	Died 10 mos. subsequently.	Some glands were enlarged and removed, but were not cancerous.	Wien. Med. Wochens., 1881, p. 1427; letter from Dr. Von Hacker, Feb. 1885.
19	Billroth	Vienna	1881 Nov. 5	M.	44	Carcinoma	?	Death on 3d day	Peritonitis	Many adhesions; pancreatic juice in belly.	Centralblatt für Chirurg., 1881, p. 319.
20	Rydygier	Kulm	1881 Nov. 20	F.	30	Stenosis from ulcer	?	Recovery	....	Alive eight months subsequently and five months pregnant.	Berlin. klin. Wochens., 1882, p. 39.
21	Langenbeck	Berlin	1881	?	?	Carcinoma	?	Death soon after operation	Collapse	Adhesions to pancreas.	Deutsch. Wochens., 1882, p. 31.

Statistical Summary of all Cases of Resection of the Pylorus recorded to February 1, 1885.—Continued.

No.	Operator.	Residence.	Date.	Sex.	Age.	Disease	Length of operation. Hours.	Result.	Cause of death.	Remarks.	Reference.
22	Gussenbauer	Prague	1881 ?	?	?	Carcinoma	2	Death in 16 hours	Collapse	....	Reported to 11th Cong. of German Surgeons, Deut. Med Wochens., 1882.
23	Lauenstein	Hamburg	1882 Jan. 3	F.	34	Stenosis from ulcer	5	Death in 8 days	Gangrene of colon and peritonitis	Mesentery of the colon was extensively detached.	Archiv f. klin. Chirurg., Bd.xxviii. p. 427.
24	Molitor	Carlsruhe	1882 Jan. 12	F.	28	Carcinoma (scirrhus)	2¾	Recovery	....	Died eleven and a half months subsequently.	Archiv für klin. Chirurg., 1883, Bd. xxix. Heft 3.
25	Van Kleef	Maestricht, Holland	1882 Jan. 27	F.	37	Stenosis from ulcer	2	Recovery	....	....	Deutsche Med. Wochens., 1882, p. 715.
26	Kocher	Berne	1882 Mar. 23	M.	35	Carcinoma	?	Death on next day	Collapse	....	Corresp. blatt. für Schweiz Aertze, 1883, Dec. 1st.
27	Southam	Manchester, England	1882 April 5	M.	43	Carcinoma (scirrhus)	1½	Death in 14 hours	Collapse or acute septicæmia	....	Brit. Med. Journal, April 15, 1882, p. 163.
28	Fort	Rio Janeiro	1882 April 17	F.	?	Carcinoma (scirrhus)	3	Death in a short time	Collapse	An exploratory incision had been previously made and closed.	Gazette des Hôpitaux, 1882, p. 979.
29	Hahn	Berlin	1882 May 20	F.	63	Carcinoma	?	Death on 8th day	Peritonitis	Rupture of sutures; no adhesions.	Berlin. klin. Wochens., 1882, p. 561.
30	Richter	San Francisco	1882 May 21	M.	51	Carcinoma	2½	Death in 3 hours	Collapse	No adhesions.	Western Lancet, San Francisco, 1882, p. 289.
31	Caselli	Genoa	1882 June 14	F.	?	Carcinoma	2	Death on same day	Collapse	....	La Salute Italia Medica, 1882, p. 169.
32	Billroth	Vienna	1882 Aug. 3	F.	?	Stenosis from swallowing caustic soda	?	Death on 6th day	Peritonitis	Sutures gave way.	Letter to Phil. Med. News, vol. xli. p. 319.
33	Maurer	Stuttgart (?)	1882 Sept. 4	F.	53	Carcinoma (colloid)	3	Death in 3 hours	Collapse	....	Archiv für klin. Chirurg., Band xxx. Heft 1.
34	Jones	England	1882 Oct. 17	?	57	Carcinoma (colloid)	ong	Death in 6 hours	Collapse	....	Lancet, 1882, vol. ii. p. 859.
35	Gussenbauer	Prague	1882 Oct 20	F.	38	Carcinoma	3½	Death on 6th day	Purulent peritonitis	Two stitches ruptured.	Med. and Surg. Reporter. See letter by Lewis Schwartz, M.D., Dec. 30, 1882.
36	Bardenheuer	Cologne	1882	?	?	Carcinoma	?	Death in 8 days	Peritonitis	Adhesions to pancreas.	Centralblatt f. Chirurg., 1882, No. 46.
37	Bardenheuer	Cologne	1882	?	?	Carcinoma	?	Death on 2d day	?	Adhesions to pancreas.	Centralblatt f. Chirurg., 1882, No. 46.
38	Bigi	Perugia, Italy	1882 Nov. 11	F.	38	Carcinoma	2½	?	....	....	London Medical Record, Aug. 15, 1883.
39	Molitor	Carlshruhe	1883 Jan. 4	F.	44	Carcinoma (medullary)	4	Death on 3d day	Gangrene of colon and septic peritonitis.	....	Archiv für klin. Chirurg., vol.xxix. Heft 3, 1883.
40	Czerny	Heidelberg	1883 Jan. 29	F.	39	Carcinoma (colloid)	2½	Recovery	....	Adhesions to pancreas; Died April 24, 1884.	Wien. Med. Wochens., 1883, No. 17.

Statistical Summary of all Cases of Resection of the Pylorus recorded to February 1, 1885.—Concluded.

No	Operator.	Residence.	Date.	Sex.	Age.	Disease.	Length of operation. Hours.	Result.	Cause of death.	Remarks.	Reference.
41	Mikulicz	Cracow	1883 Feb. 22	..	25	Carcinoma (colloid)	2½	Recovery	....	Alive when last heard from.	Wien. Med. Wochens., 1883, p. 705.
42	Billroth	Vienna	1883 June 24	F.	39	Carcinoma (scirrhus)	1½	Recovery	....	Alive Jan. 1885; has recurrence Letter from Dr. von Hacker.	Wien. Med. Wochens., 1883, p. 1213.
43	Socin	Basle	1883 summer	M.	38	Carcinoma	?	Death in a few h'rs	Collapse	Profuse hemorrhage; ligature of hepatic artery	Corresp. bl. für Schweizer Aerzte, Dec 1st, 1883.
44	Socin	Basle	1883 July 15	F.	43	Carcinoma	2	Recovery	....	Patient out in fourteen days; recurrence in less than a year; and a gastro-enterostomy performed.	Corresp. bl. für Schweizer Aerzte, Dec. 1st, 1883.
45	Superno	Pontidera, Italy	1883 July 25	F.	43	Carcinoma	2¾	Died on 3d day	Peritonitis	....	Gaz. degli Ospitali, Aug. 12, 1883.
46	Heinecke	Erlangen	1883 August	?	?	Carcinoma	?	Recovery	....	....	Centralblatt für Chirurgie, 1883, p. 852.
47	Kocher	Berne	1883 Sept. 21	F.	42	Carcinoma	?	Recovery	....	Up in eighteen days; no adhesions.	Corresp. bl. für Schw. Aerzte, Dec. 1st, 1883.
48	Baikoff	St. Petersburg	1883	F.	38	Carcinoma	4½	Death on 7th day	Exhaustion & paralysis of stomach	....	London Med. Record, 1884, July 15, from Vratsch, 1883, No. 8.
49	Reyher	St. Petersburg	1883	F.	42	Carcinoma	4	Death in 4 hours	Collapse	....	Ibid.
50	Zamboni	Conegliona, Italy	1883 Nov. 5	?	?	Carcinoma	2	Death on 7th day	Purulent peritonitis	....	Gazetta degli Ospitali, Dec. 12, 1883, and ibid. 1884.
51	Ruggi	Bologna	1883 Nov. 17	F.	40	Carcinoma	3	Death in 22 hours	Collapse (rapid exhaustion)	....	Gaz. degli Ospitali, Dec. 23, 1883.
52	Czerny	Heidelberg	1884 Feb. 19	F.	40	Colloid	2¼	Death on 4th day	Gangrene of colon	....	Wien. Med. Wochens., 1884, No. 17.
53	Billroth	Vienna	1884 Feb. 26	F.	36	Scirrhus	1½	Recovery	....	Was well, without recurrence, in Jan. 1885.	Wien. Med Wochens., 1884, p. 434, reported by von Hacker.
54	Czerny	Heidelberg	1884 Mar. 3	M.	56	Carcinoma	2¾	Death on 7th day	Gangrene of colon	Adherent to pancreas.	Wien. Med. Wochens., 1884, No. 17.
55	Billroth	Vienna	1884 July	..	..	Carcinoma	....	Recovery	....	Is still alive.	Letter from Dr. Victor Ritter von Hacker received Feb. 5, 1885.
56	Winslow	Baltimore	1884 Aug. 4	F.	42	Carcinoma	3	Death in 2 hours	Collapse	Tumor not adherent.	American Journ. of Med Sciences, July, 1884.
57	Billroth	Vienna	1884 summer	..	..	Carcinoma	....	Death	....	....	Letter from Dr. von Hacker.
58	Woelfler	Vienna	1884 summer	..	..	Carcinoma	....	Death	....	....	Ibid.
59	Billroth	Vienna	1884	..	..	Cicatricial stenosis	....	Recovery	....	Radically cured.	Ibid.
60	McEwen	Glasgow	1884 October	..	..	Carcinoma	....	Death in a few h'rs	Collapse	....	Brit. Med. Journ., Nov. 1, 1884.
61	Spear.	Cumberland, Md.	1885 Jan. 10	M.	40	Cicatricial stenosis	1½	Death in 2½ hours	Collapse	Not adherent.	Letter from Dr. J. M. Spear; AM. JR. MED. SCI., April, 1885, p. 361.

NOTE.—Prof. v. Bergmann, of Berlin, recently excised the pylorus whilst removing an extensive cancerous growth. The man died.—*Journ. Am. Med. Ass.*, Feb. 14, 1885. Prof. Billroth, on Jan. 15, 1885, performed a modified pylorectomy upon a man suffering from scirrhus. Gastro-enterostomy was first performed in the usual manner, then the tumor excised, and the cut ends of the stomach and duodenum were entirely closed with sutures and not joined together. Operation lasted one hour and forty minutes, and patient was doing well when reported. Letter from G. W. Davis, M.D. (who was an eye-witness), in the *Boston Med. and Surg. Journal*, Feb. 19, 1885.

Retrospect.—In glancing over this table the first thing to attract attention will probably be the very great rapidity with which this operation became popular, and possibly the fact that the frequency of its performance has progressively declined during the past three years. If we tabulate the operation by years the following results are obtained: In 1879, Péan performed his solitary successful operation. In 1880, one case by Rydygier, also fatal. 1881, 20 cases were operated on by 16 surgeons, with 5 recoveries and 15 deaths; or, 25 per cent. successful, 75 per cent. fatal. In 1882 there were 16 operations by 15 surgeons, with 2 recoveries and 13 deaths, one case result unknown to me; or, $13\frac{1}{3}$ per cent. successful, $83\frac{2}{3}$ per cent. fatal. In 1883, 13 operations were performed by 12 surgeons; 6 recoveries and 7 deaths; successful, 46.15 per cent.; fatal, 53.85 per cent. In 1884, 9 operations are all that I can find notice of, performed by 5 surgeons, with 6 deaths and 3 recoveries; successful, $33\frac{1}{3}$ per cent.; fatal, $66\frac{2}{3}$ per cent. In January, 1885, one fatal case. Total operations, 61; recoveries, 16, or $26\frac{2}{3}$ per cent.; deaths, 44, or $73\frac{1}{3}$ per cent.; result in one case unknown to me.

Most of these operations have been performed in Austria and Germany, but isolated cases have been operated on in various portions of the globe. In Austria 18 operations have been performed, with 8 recoveries, or 44.44 per cent., and 10 deaths, or 55.56 per cent. Of these cases Billroth has performed 11, with 6 recoveries, $54\frac{1}{2}$ per cent., and 5 deaths, $45\frac{1}{2}$ per cent. In Germany 18 patients have undergone pylorectomy, with 6 recoveries, $33\frac{1}{3}$ per cent, and 12 deaths, $66\frac{2}{3}$ per cent. Of German surgeons, Czerny has performed the most operations, 4, with 50 per cent. recoveries. In Holland, 2 cases; 1 recovery and 1 death; each 50 per cent. In Great Britain, 3 cases, all fatal. In France, 1 fatal case. In Switzerland, there have been 6 operations, with 2 recoveries, $33\frac{1}{3}$ per cent. In Italy, 5 cases, with 4 deaths; 1, result unknown. In Russia, 3 cases, all fatal. In the United States of America, also 3 cases, which were fatal. Norway and Brazil are each credited with 1 unsuccessful case. From the above classification it is seen that pylorectomy in the hands of the Austrian surgeons has been followed by $44\frac{1}{2}$ per cent. of successes, whilst in Germany the percentage of recoveries is $33\frac{1}{3}$ per cent. Switzerland has the same average, but with only one-third of same number of operations, whilst Holland has the highest average, 50 per cent., but with only 2 cases. The United States of America, Great Britain and Russia, France, Brazil, and Norway, present a unanimous average of 100 per cent. of deaths. One is forced to recognize the fact that it is in the hands of Billroth and his special pupils, Czerny, Mikulicz, and Woelfler, that the best results have been obtained. This is a coincidence which is probably more than accidental, and bespeaks the skill of the great Vienna surgeon, both as an operator and as the teacher of skilful operators.

Sex.—Of the 61 patients operated on, 33 were women and 14 men, the sex of 14 being unknown to me. Why there should be such a disproportion between males and females I am unable to say, but it is probably accidental, as in 1303 cases of cancer of the stomach, tabulated by Wilson Fox,[1] 680 were males, and 623 females.

The ages of the patients varied from 25 to 64 years. Those in whom recovery took place were respectively 25, 28, 28, 30, 36, 37, 39, 39, 39, 42, 43, 43, 52 years of age. Age seems to have considerable influence upon the mortality of the operation, young persons not succumbing to the great depression as readily as those who are older.

Duration of Operation.—The length of time required for the performance of the operation varied from 1¼ to 5 hours. As might be expected, the long duration of the anæsthesia, and the cooling of the system which must occur in all very protracted operations, both, act as powerfully depressing agents, and the mortality is materially influenced thereby. No patient recovered where three hours were consumed in the operation.

The amount of tissue removed varied greatly, in some cases nearly 5 inches was excised from the greater curvature and in several of these recovery occurred. In two of Billroth's successful cases 5 inches (14 cm.) were removed from the greater curvature, but he finished the operation in 1¼ and 1½ hours respectively, the shortest time on record, and the success probably depends more upon the celerity of the operation, than upon the amount of the gastric wall which is excised. In point of quickness the master Billroth bears the palm, as well as in general excellence of results.

Prognosis.—Whilst the result of the operation depends much upon the age and strength of the patient, the length of time required for operation, and the skill of the operator, it depends more upon the presence or absence of adhesions between the stomach and the neighboring viscera; and the determination of this point is impossible until the abdomen has been opened, and not always then. It is impossible to determine an absence of adhesions from the mobility of the tumor, for in several cases even after the abdomen had been opened, the presence of adhesions was not made manifest until the operation had progressed to such a point that it was utterly impossible to discontinue it. This was so notably in the cases of Langenbeck, of Lücke, and Jurié.[2] Adhesions to the pancreas are especially dangerous, and, if extensive, absolutely contraindicate the resection, chiefly on account of the great difficulty in arresting hemorrhage, but also from the fact that pancreatic tissue readily sloughs, and may allow the secretion of the gland to escape into the abdominal cavity. In Rydygier's case of excision for ulcer there were strong adhesions to the pancreas, which necessitated the excision of a considerable portion of its tissue, as happened also in one of Billroth's cases. Both of these cases were successful. With few exceptions, those patients in whom there were adhesions to the pancreas died. In the case operated on by Berns the vena cava was exposed for a distance of three inches and a portion of the pancreas excised, and in the case of Lücke there were many adhesions, and the portal vein was laid bare for some distance. Extensive adhesions to the transverse colon also expose the patient to great danger, on account of the liability to the occurrence of gangrene, an event which caused the death of Lauenstein's and Molitor's patients, and both of Czerny's. The latter surgeon[1] says we must be alive to this danger, and when it is necessary to detach the mesentery of the colon, a corresponding portion of the gut must be excised. Diffuse carcinomatous infiltration equally renders the operation unjustifiable.

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[1] Reynolds's System of Med., Am. ed., vol. iii. p. 106.

[2] Bulletin Gén. de Thérap., vol. civ. p. 216.

Indications for the Operation.—What are the indications for which excision of the pylorus has been performed? 1st. Carcinoma, which, either on account of unendurable pain and distress, or by the production of stenosis and vomiting, threatened death from starvation. 2d. Ulcer of the stomach, which, in its cicatrization, produced a sufficient coarctation to close the pyloris. 3d. Stenosis, from swallowing a caustic liquid.

The vast majority of these operations have been performed on account of cancerous disease; 55 for this cause, 5 for idiopathic ulcer, and 1 for stenosis due to swallowing caustic soda with suicidal intent. In those reports, where the form of malignant disease is distinctly noted, it is seen that the mortality is very much less in colloid than in the other varieties of cancer. Thus, of 7 cases noted, 5 recovered, 3 of which died from recurrence at periods varying from 4 to 18 months. Woelfler's case remained healthy one year, when the disease recurred in the cicatrix, which was removed, and she again left hospital; she re-entered the wards in the summer of 1883, and is still alive, nearly four years from the time of the primary operation, but with recurrent growths in the groin. Adhesions to the pancreas and other neighboring organs are found in a large majority of cases, and enlargement of the adjacent lymphatics is almost always present. I have not noted the exact proportion of cases in which adhesions and glandular involvement were present, and as the references are not accessible at the time of writing, I will borrow from the editorial in *The Medical News*, November 24, 1883, formed from a study of 31 cases, in 8 of which neither adhesions nor glandular infection were noted, the mortality being 50 per cent., whilst in 23 these features were present, with only about 20 per cent. of recoveries.

When we consider the great gravity of this operation, the huge percentage of deaths, the impossibility of telling in advance whether adhesions are present or not, the great difficulty in removing the entire disease, and the certainty of the recurrence of the trouble either *in situ* or by metastasis, it is to the mind of the writer becoming more and more apparent that resection of the cancerous pylorus ought not to be performed, except under very exceptional circumstances. The number of months of life secured to the few does not compensate for the dreadful mortality of the operation. Quite otherwise is it with stenosis due to ulcer or to any non-malignant cause, not only is the mortality 25 per cent. less, but in the cases in which recovery has taken place, health has been fully restored. The case of Rydygier was presented to the Eleventh Congress of German Surgeons eight months after the resection had been performed, and not only was the patient in robust health, but had improved the time to the extent of being five months advanced in pregnancy. It is possible that better results might be obtained in cancer of the pylorus, if the operation was not performed as a dernier resort, but few surgeons, however, would be willing to submit patients to such a dangerous procedure as long as life was tolerably endurable, and but few patients would be willing to submit to operation until every other hope had proved delusive.

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[1] Wien. Med. Wochenschrift, 1884, Nos. 17, 18, 19.

Two other indications are given by Rydygier[1] and von Hacker[2] for excision of the pylorus: uncontrollable hemorrhage from ulcer and perforation. In regard to the first of these, severe hemorrhage can scarcely ever come into consideration as an indication for this operation, as it is generally impossible to tell in advance what is the cause of the bleeding, whether from ulcer, cancer, simple inflammation, or hepatic disease. It might, however, justify in a very few cases an exploratory incision in order to determine the cause, and possibly the vessel might be secured, or the hemorrhage controlled by cautery or otherwise. I do not see how the presence of hemorrhage could of itself be an indication for excision. In regard to the perforation from ulcer, it would be the plain duty of the surgeon to perform laparotomy, if the condition were recognized, or even suspected; the probabilities would, however, be immensely in favor of a fatal termination from peritonitis, and it appears to the writer that such an individual would scarcely be placed in a more favorable condition by an excision of the pylorus. It would be better, when possible, simply to excise the ulcer itself, or to invert the torn edges and unite them with sutures.

Causes of Death after Pylorectomy.—Collapse is assigned as the cause of death in 27 cases, in 2 of which it was doubtful to the reporter whether death was to be attributed to simple collapse or to acute septicæmia. Of those dying in collapse, the periods at which death occurred are from "a short time after the operation" to 26 hours. 3 died of inanition and exhaustion on the 5th, 7th, and 8th days respectively. Peritonitis caused death in 10 cases, in 4 of which gangrene of the colon was present, due to extensive detachment of the transverse mesocolon and consequent interference with its blood supply. In 3 other cases in which peritonitis occurred some of the stitches were found to have become detached, and the contents of the stomach had escaped into the peritoneal cavity. In two of the cases in which gangrene of the colon occurred, there were also thoracic complications of septic origin; in one pyopneumo-thorax, in the other pleurisy.

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[1] Centralblatt f. Chirurg., Nov. 18, 1882.
[2] Wien. Med. Wochenschrift, 1884, p. 888.

From these items we learn that almost 50 per cent. of all those subjected to resection of the pylorus have succumbed in less than 26 hours from collapse; the patients not having had sufficient vitality to react from the prolonged and depressing operation. 16½ per cent. of all cases died from peritonitis, from one or another cause; in several having been caused by the premature loosening of the sutures. This is a recognized danger which should be guarded against by a careful revision of the lines of union. Gangrene of the colon has proven an unexpected and very urgent danger, and it should be guarded against by detaching the mesocolon as little as possible, and when extensive detachment is necessary, by resection of the corresponding portion of the colon.

Technique of the Operation.—It would occupy too much time and space to enter minutely into a discussion of the technique of pylorectomy; besides it would be only repeating that which is already well known to most surgeons. Those who are interested in learning more in detail the various steps of the operation, I would refer to the translation of Dr. Woelfler's pamphlet, "Uber die von Herrn Professor Billroth Ausgeführten Resectionen des carcinomatösen Pylorus," appended to Billroth's Clinical Surgery, published by the New Sydenham Society in 1881; to Wiener Medizinische Presse, 1881, vol. xxii. p. 770; or to Rydygier's excellent lecture in Volkmann's Sammlung Klinischer Vorträge, No. 220. I will content myself with presenting here only a brief outline of the operative acts.

Preliminary Preparation.—Several days previous to, and again shortly before the operation, the stomach ought to be thoroughly evacuated and its cavity well irrigated with some antiseptic solution; salicylic acid 1–1000, being that which is used by many surgeons. This can be effected readily by an ordinary stomach tube or piece of large drainage tube, into the end of which a funnel is inserted; the patient being in a sitting posture. Water is allowed to flow into the stomach until it is filled, then by depressing the end of the tube, or by causing the patient to assume the prone position, the current will be reversed and the viscus emptied. In this, as in abdominal operations in general, the observance of those important surgical principles of cleanliness and antisepsis is of the utmost importance.

The operation itself is divided into five stages:—

1*st Stage. The abdominal incision.*—It is a matter upon which there is considerable difference of opinion as to the best position for the abdominal incision. Billroth prefers a transverse or an oblique incision over the most prominent portion of the tumor, which in his opinion affords better access to the seat of disease, but Czerny, who is the next most experienced and skilled operator, and Rydygier, as well as several other surgeons, made their incisions in the middle line, and found it to answer every purpose. There are, perhaps, but few cases in which an incision in the linea alba will not give sufficient space, and when such is the case, it would not complicate the operation much to make an additional transverse cut. It is certainly more difficult to maintain accurate apposition of the incision when the muscles have been divided transversely; and in one case peritonitis began at the transverse incision. Having opened the abdomen the first duty of the surgeon is to see whether the tumor has contracted such adhesions as will prevent a total extirpation of the disease, or which will render the operation long and difficult. Equally important is it to ascertain whether the malignant disease is diffused or confined to the pylorus and adjacent stomach wall. If the adhesions are great, or the disease disseminated, the operation must be discontinued and the abdomen closed; or if the stenosis is marked a gastro-enterostomy must be performed.

2*d Stage. Isolation of the tumor.*—The isolation of the pyloric tumor is effected by ligaturing the greater and lesser omenta in small portions with double ligatures, and cutting between the threads. The omenta must only be detached to a point corresponding to the line of the proposed excision, otherwise gangrene of the stomach or duodenum might occur. Warm carbolized or sublimated towels or pieces of gauze, or large flat sponges, are now pushed under the stomach, and the rest of the operation becomes extra-peritoneal to a large extent, any blood or intestinal contents being absorbed by the compresses.

3*d Stage. Resection of the diseased portion.*—The stomach is now secured by the hands of an assistant or clamped with forceps or rods covered with rubber, and it is divided from the smaller curvature obliquely downward from the left to the right. The difference between the lumina of the stomach and duodenum is to be overcome by bringing together the upper portion of the incision in the stomach, leaving an opening at the greater curvature of a size to correspond with the duodenum. In effecting this occlusion of the upper part of the incision, the mucous surfaces are first united with internal sutures, and then the serous surfaces are inverted by the Lembert suture, about one-third of an inch of the peritoneum being included in each suture, which is so passed as not to penetrate the mucous membrane, and finally a row of interrupted or continuous sutures, the whole forming the "tier" suture of Czerny. Péan and Rydygier employed catgut for suture, but strong silk rendered aseptic is more durable and equally as unirritating. Several modifications have been introduced by various surgeons, thus some prefer the hands of an assistant to clamps for preventing the escape of the gastric and intestinal secretions, whilst others prefer mechanical occlusion as being more certain and less liable to accidents than that by the hand. After the division and occlusion of the stomach, the duodenum is divided and the diseased portion removed. Hemorrhage should be prevented by ligating the vessels as they are cut, hence it is recommended to divide the parts in successive cuts, stopping to seize the vessels. Kocher in addition recommends and practised successfully the crushing of a limited zone with forceps.

4th Stage. Reunion of stomach and duodenum.—As the result of experience all operators now prefer to insert the duodenum upon the greater curvature of the stomach. This is effected by a double or treble row of sutures; beginning from within, the posterior walls of the viscera are united by sutures which are entered and brought out between the mucous and muscular coats and in effect make a Lembert suture, only they are tied from within; the mucous surfaces are then sutured separately all around. The union of the anterior portion is effected by ordinary Lembert sutures, with an additional tier of interrupted or continuous stitches. After carefully inspecting all the sutures in order to be sure of their security, the parts are cleansed and disinfected and replaced.

5th Stage. Closure of abdominal incision.—This is effected in the usual manner; when the incision is transverse, it will be necessary to employ great care in carefully approximating the edges and in supporting them by deep relaxation sutures. An antiseptic dressing completes the operation. After the operation nourishing enemata are to be administered regularly every three hours, and only cracked ice allowed by the mouth. By the next day small quantities of milk or fluid may be permitted, and if the case progresses favorably solid food can be borne by the second week.

The operative technique is already nearly perfect, but it can rarely be completed under two hours, and usually the patient is in a condition of profound shock at its termination, from which he frequently fails to rally.

Results of Pylorectomy.—From a consideration of the statistics of pylorectomy for all causes, we learn that 26⅔ per cent. of those operated on have survived the operation, and 73⅓ per cent. have succumbed to causes set in motion by the procedure, the vast majority perishing in collapse within twenty-four hours.

Of the operations performed for carcinoma 24 per cent. recovered and 76 per cent. died. Of those who recovered, the first died 4 months subsequently from recurrence. The second, Woelfler's case, is still alive nearly four years subsequently, but has already submitted to one or more operations for the removal of recurrent growths of the abdominal wall, and has now an enlargement of the inguinal glands. She looks well, however. The 3d case died in 18 months; the 4th in 10 months; the 5th in 11½ months; the 6th in 15 months; the 7th, Mikulicz's, is probably still alive; the 8th, Billroth's, alive but with recurrence; the 9th, Socin's, after having made a wonderfully rapid recovery, went to work and supported her family, but the disease recurred, and 11 months subsequently gastro-enterostomy was successfully performed, and at last report, 4 months subsequently, she was again working for her living, Of the 10th case, Heineke's, I have no knowledge, nor of the 11th, Kocher's; both were performed late in 1883, and are probably alive. The 12th and 13th, performed about one year ago by Billroth, are alive and free from disease. The fact is indisputably proven that no case of cancer of the pylorus has been extirpated with the final result of a cure lasting over three years without recurrence. This fact, alone, however, ought not to deter one from the operation but for the very great mortality incident to it. 6 cases of non-carcinomatous stricture of the pylorus have been resected, with 50 per cent. of recoveries. In those who have recovered it is probable that the final results are perfect. Rydygier presented his patient to the 11th Congress of German Surgeons eight months later, and she was not only in robust health, but was advanced five months in pregnancy. Dr. Von Hacker writes me in regard to the case operated on by Billroth last year, that it is "radically cured."

GASTRO-ENTEROSTOMY.—This operation was first performed by Dr. Anton Woelfler, of Vienna, on September 27, 1881. It was devised upon the spur of the moment, as a substitute for pylorectomy in a case in which excision was rendered inadmissible, owing to extensive adhesions of the pylorus to the pancreas. As there was a high degree of stenosis present, and the man was dying from inanition, it was decided to attempt to afford an exit for the gastric contents by establishing a communication between the stomach and a neighboring loop of small intestine. The patient was thirty-eight years of age, and presented the usual symptoms of pyloric cancer. Upon the above date, Dr. Woelfler prepared to perform resection, but after opening the abdomen found the conditions too unfavorable, and rejecting duodenostomy, the only other alternative, he simply raised the nearest loop of small intestine, and after making an incision one and one-half inches in length in the free border of the gut and in the anterior stomach wall near the great curvature, united the edges of the two openings with Lembert sutures. The result was all that could have been expected, the patient, who had been vomiting incessantly for three months, ceased to regurgitate his food immediately, and in a few days well-formed stools were passed, and the bodily condition of the patient rapidly improved. He lived four months after the operation, a period of time exactly equal to that of Billroth's first resection. Gastro-enterostomy has been performed for all causes, thirteen times, as far as I can ascertain. It is easier to perform than pylorectomy, takes less time to accomplish, and exposes the patient to fewer risks. The following table contains all the operations recorded to date :—

Statistical Summary of all Cases of Gastro-enterostomy

No.	Operator.	Residence.	Date.	Sex.	Age.	Disease.	Duration of operation.
1	Woelfler	Vienna	1881 Sept. 27	M.	38	Carcinoma	?
2	Billroth	Vienna	1881 Oct. 2	M.	45	Carcinoma	1 hour
3	Lauenstein	Hamburg	1881 Dec. 15	M.	50	Carcinoma	2 hours
4	Rydygier	Kulm	1882 May	M.	54	Carcinoma	?
5	Lücke	Strassburg	1882 May	F.	?	Carcinoma	?
6	Kocher	Berne	1882 June 5	M.	50	Carcinoma	?
7	Lauenstein	Hamburg	1882	F.	25	Carcinoma	?
8	Courvoisier	Basle	1883 Oct. 19	F.	56	Carcinoma	2 hours 50 min.
9	Woelfler	Vienna	1883	?	?	Carcinoma	?
10	Rydygier	Kulm	1884 March 13	M.	20	Stenosis of duodenum from ulcer.	?
11	Monastyrski	Russia	1884	M.	36	Stenosis from swallowing sulphuric acid.	2 hours
12	Ransohoff	Cincinnati	1884 April 12	M.	34	Carcinoma	?
13	Socin	Basle	1884 June 5	F.	44	Recurrent carcinoma	1¼ hours

From this table it will be seen that gastro-enterostomy was devised as a substitute for pyloric resection in those cases in which extensive diffusion of the disease rendered excision impracticable, and in which marked stenosis of the pylorus prevented the passage of the chyme into the duodenum. It is then an operation which does not aim at the production of a radical cure, but only of a temporary relief of the vomiting and distress due to obstruction. In but one case does it appear that this procedure was performed upon a patient on whom pylorectomy could have been easily accomplished. Our countryman, Dr. Ransohoff, performed gastro-enterostomy upon a patient upon whom pylorectomy could have been readily carried out, but as he was exceedingly debilitated it was judged best to establish a gastro-jejunal fistula, as being a less severe and shorter operation, and one which in the light of recorded pylorectomies offered at least as good a chance of prolonging life. The early death of his patient, of collapse, at least evinced the wisdom of declining the longer operation.

Dr. Rydygier performed gastro-enterostomy for other cause than extensive cancerous disease; his patient suffered from stenosis due to duodenal ulcer, and the channel for the food was diverted by uniting the stomach and jejunum.

Monastyrski also performed gastro-enterostomy for non-malignant stenosis. In the reported cases, thirteen in number, only four have recovered from the operation, but too unfavorable conclusions must not be drawn from this fact alone, as the condition of these patients was such as to have caused death in a short time without any operation. It seems to me that *recorded up to February* 1, 1885.

No.	Result.	Cause of death.	Remarks.	Reference.
1	Recovery	....	Cancerous adhesions prevented resection	Centralblatt für Chirg., 1881, No. 45.
2	Death on 10th day	Obstruction from bending of intestine.	Cancerous adhesions prevented resection	Ibid.
3	Death on 3d day	Exhaustion	Disease too diffuse for resection.	Archiv für Klin. Chirg., Bd. xxviii. p. 420.
4	Death on 4th day	Hemorrhage from wound	Dis too diffuse for resection; glands involved	Centralblatt für Chirg., 1883, p. 241.
5	Recovery	....	....	Deutsche Zeitsch. für Chirg., 1882, Bd. xvii. p. 573.
6	Death on 3d day	Bending of intestine	Cancer diffused; stenosis marked	Corresp. bl. für Schw. Aerzte, Dec. 1, 1883.
7	Death in 4 weeks	Marasmus	Metastatic disease of liver	Virchow, Archiv, 1884, Bd. ii. 2 abtheil.
8	Death in 12 days	Peritonitis and abscess	Cancer diffused	Corresp bl. f. Schw. Aerzte, Dec. 1, 1883.
9	Death soon	?	.. ..	Med. Times and Gazette, London, Oct. 27, 1883.
10	Recovery	....	Duodenum was strictur'd near pylorus, from ulcer	Centralblatt f. Chirg., 1884, Beilage to 23.
11	Death same day	Collapse	....	Centralblatt f. Chirg., 1884, p. 352.
12	Death in 8 hours	Collapse	Pylorectomy could have perf'med but for asthenia	Med. News, Nov. 22, 1884, p. 578.
13	Recovery	....	Pylorectomy had been successfully performed on July 15, 1883	Corresp. bl. f. Schw. Aerzte, Nov. 1, 1884, p. 513.

this method is especially applicable to ulcer of the stomach, and that its most valuable application might perhaps be found in this affection. Ulcus ventriculi is frequently situated at the pylorus, and is consequently irritated by the passage of food over its surface. It might gain more physiological rest if an opening were made elsewhere; at any rate, its cicatrization would not prevent the onward passage of the contents of the stomach.

The *technique of the operation* is sufficiently simple: a transverse incision over the stomach, the raising of the nearest piece of jejunum, and the attachment of its free border to the greater curvature of the stomach by means of interrupted sutures to the edges of the incision, and Lembert sutures to the peritoneal and muscular coats. The intestine must be clamped above and below the point at which the incision is to be made. The opening between the stomach and intestine ought to be one to one-and-one-half inches in length.

Comparisons.—Let us examine a little more closely the causes of death following this operation, and the periods at which the fatal event occurred, and in that manner we may be able to reach a more accurate comparison of the dangers and results incident to gastro-enterostomy and pylorectomy. Of 13 cases operated on, 9 have died at periods varying from 8 hours to 4 weeks; hence the proportion of recoveries is about 30$\frac{3}{4}$ per cent. Of 11 cases operated on for carcinoma, 3 recovered, or 27$\frac{1}{4}$ per cent. Of the first 13 cases of pylorectomy, 3 recovered, or 23 per cent. Of the first 11 cases operated on for carcinoma, 2 recovered, or 18$\frac{1}{4}$ per cent.; hence it is seen that the advantage is in favor of gastro-enterostomy. It is scarcely fair to compare the results of an operation which has been performed only 13 times, with the average results of one which has been performed five times as often, though even when the average of the whole number of pylorectomies is compared with that of gastro-enterostomy, it will not be to the disadvantage of the latter. It is a noticeable fact that only 3 have died from collapse; whilst in the first 13 pylorectomies 8 died within 26 hours from this cause. There seems, however, one danger inherent to this operation, which is the liability of the portion of intestine which has been attached to the stomach to form an angle, thereby interfering with the passage of the contents of the duodenum and stomach onwards. This occurred in Billroth's and Kocher's cases, and caused death in each, on the 10th day in one, and the 3d in the other. This accident can be prevented by uniting a greater extent of intestine to the stomach. The remaining deaths were from exhaustion, hemorrhage from the wound, and peritonitis, and in the second case of Lauenstein, which survived four weeks, and might properly be classed amongst the recoveries, from marasmus and metastatic disease of the liver. Courvoisier's case lived nearly two weeks, and died of peritonitis, due to an abscess, not having any connection with the seat of operation, which was found to be well healed.

Whilst the statistics of this operation at present only show 30 per cent. of recoveries, there is but little doubt that if it had been performed before the condition of the patients became so desperate, the successes would have been much more numerous. If, for example, in 1882, when 13 pylorectomies, with but two recoveries, were done, these patients had been submitted to gastro-enterostomy, it is entirely probable that the results would have been much better. Of the cases which recovered, 2 survived more than 4, and one more than 6 months, whilst the case of duodenal stricture was probably permanently relieved. Here the advantage is on the side of pylorectomy, for of the first 3 recoveries, one died in 4 months; the 2d, Woelfler's, is still alive, almost 4 years from the original operation, as I have just learned through the kindness of Dr. Ritter von Hacker, assistant on Prof. Billroth's clinic. The 3d recovery, that of Czerny, died in 18 months. The sum total of extension of life divided amongst the 3 gives each about 22$\frac{2}{3}$ months. Of 10 recoveries after pylorectomy for carcinoma, the dates of whose deaths are known, or who are known to be still alive, an average of 16 months of life has been gained. Now whilst these results are good, and will doubtless increase in excellence as surgeons become more skilled in the performance of pylorectomy, it becomes a very serious question whether gastro-enterostomy by giving a shorter lease of life to more patients, is not, on the whole, to be preferred. If the patient is strong, and adhesions are absent, pylorectomy may be admissible, but if the patient is much run down, or there are adhesions to the pancreas, or glandular infiltration, there can be no doubt that gastro-enterostomy ought to be performed. Neither operation is radical, and that which will bring temporary relief to the greatest number ought to be adopted. There is a class of patients whose lives are being slowly consumed with hunger and pain, upon whom it is proper to attempt, by operative means, to secure a measure of comfort during their remaining days or months of existence, and at last to obtain for them an euthanasic end. This I believe can be accomplished by gastro-enterostomy as far as it is possible for any operation to accomplish it.

GASTRECTOMY.—Amongst exceptional measures attempted for the relief of pyloric stenosis, due to extensive cancerous disease, may be mentioned, total extirpation of the stomach, by Connor, of Cincinnati. The operation was undertaken on December 7, 1883, at the urgent request of the patient, a woman, fifty years of age, and was not completed, the patient dying upon the table from shock. "He had hoped in his case to be able to get the cardiac end of the stomach attached to some portion of the intestinal tract, he did not care much where, so that the fluids poured out in the upper part of the small intestine might flow down to meet the food, and cause digestion in the part of the intestine where they come together. The operation he considered perfectly feasible, as far as the operative procedures are concerned."[1] A gastro-enterostomy would have given the patient a better chance for life.

GASTROSTOMY.—Gastrostomy[2] was performed by Hahn, of Berlin, in one case and a tube passed through the pylorus into the duodenum with the result of prolonging the life of the patient three weeks. I do not know the history of this case, but judge that if the disease were limited to the pylorus, and the patient had strength sufficient to survive gastrostomy, better success might have attended gastro-enterostomy.

DUODENOSTOMY.—Another operation which has been performed for the relief of pyloric stenosis is duodenostomy, or the establishment of a duodenal fistula through which the patient could be fed. As far as I have been able to ascertain, this has been done but three times, all of which terminated fatally, not so much however as the result of the operation, as from the fact that it had been delayed too long.

Statistical Summary of Cases of Duodenostomy.

No.	Operator.	Residence.	Date.	Sex.	Age.	Diagnosis.	Result.	Cause.	Reference.
1	Langenbuch	Berlin	1879 Sept 4	F.	32	Carcinoma	Death on 7th day	Inanition	Berl. Klin. Woch. 1881, p. 236.
2	Robertson	Oldham England	1883	?	?	Cicatricial stenosis	Death in 12 hours	?	Brit. Med. Journ. 1884, vol. i. 1146.
3	Southam	Manchester, England	1884 Mr. 20	M	45	Fibrous stenosis	Death on 3d day	Inanition	Ibid.

Rydygier reported three cases of duodenal fistula, all fatal, for what cause created, I do not know.

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[1] Medical News, November 22, 1884, p. 578, also personal letter to me.

[2] Deutsche Med. Wochens., 1883, p. 319.

In two of these cases the stenosis was found to be cicatricial in character, the other carcinomatous. In the case of Langenbuch, of Berlin, which was performed on Sept. 4, 1879, an exploratory incision was made with the intention of resecting the pylorus, but the conditions were found to be too unfavorable, hence the first portion of the duodenum was united to the abdominal wound and a fistula created. The patient died of inanition. In Southam's case resection might have been easily performed, but for the great feebleness of the patient. His as well as Robertson's case were similar in character to those which have been so successfully treated by Loreta, of Bologna, by digital divulsion.

Notwithstanding the failure of these few operations to accomplish the purpose for which they were intended, they prove effectually the feasibility of the procedure. In experiments upon the cadaver, Southam found it extremely difficult to reach the first portion of the duodenum in order to attach it to the abdominal walls, but when the pylorus is the seat of disease, the stomach is usually dragged downwards and the duodenum is correspondingly displaced, and in none of these cases was any difficulty experienced in attaching the duodenum to the wound.

In the cases of Langenbuch and Southam, the operation was performed in two stages. 1st. The duodenum was attached to the wound by sutures extending through the entire abdominal parietes, and the serous and muscular tunics of the gut. 2d. After seven days in one case and three in the other the intestine was incised and nutritive instillations employed. The relief came too late, and both cases perished of inanition. No peritonitis or other unfavorable symptoms were encountered. Southam mentions inveterate ulcer of the stomach as another indication for the performance of duodenostomy, in order to give the organ physiological rest, and allow healing to occur. It seems to me that this would be a doubtful, very disagreeable, and withal dangerous remedy for simple ulcer of the stomach, and what is probably equally as good, and much safer, treatment by rectal alimentation ought to be conscientiously tried before resorting to any serious surgical procedure. If after faithfully trying rectal feeding it became necessary to undertake some operation, my preference would be for gastro-enterostomy.

One of the greatest disadvantages of gastrostomy is the irritation and excoriation of the neighboring integuments from the escape of the secretions of the stomach, equally as harassing would be the escape of the bile and other secretions from a duodenal fistula. In concluding this short review of this operation it strikes me that it is a procedure which is likely to have but few repetitions, as divulsion of the pylorus in non-malignant, and gastro-enterostomy in malignant stenosis will be sufficient for all cases which imperatively demand relief.

DIGITAL DIVULSION OF THE PYLORUS.—This operation was devised by Prof. Loreta, of Bologna, for the relief of non-carcinomatous stricture of the pylorus, and was performed successfully for the first time on Sept. 14, 1882. The first suggestion in regard to dilating cicatricial strictures of the pylorus was made by Richter,[1] of Breslau, during the discussion on resection of the pylorus at the 11th Congress of the "Deutsche Gesellschaft für Chirurgie" held at Berlin on June 2d, 1881. He said: "But for non-carcinomatous strictures a less dangerous operation, the forming of a duodenal fistula, through which bougies can be used, appears better." This sentiment did not meet with much approbation from the surgeons present, and Billroth immediately expressed his opinion that "stenosis, the result of an ulcer, justified the operation of resection." Loreta appropriated Richter's suggestion, but modified it, so that as performed by himself the operation consisted of immediate and forcible divulsion of the contracted orifice by the finger, instead of the more tedious, and probably more dangerous instrumental dilatation. In one case a gastric fistula must be formed and maintained, whilst in the other the incision in the stomach is sewed up and the wound closed. Casati[2] says: "The merit of priority in the proposal of dilatation in pyloric stenosis belongs to Richter, but one must recognize in the divulsion of Loreta a substantial modification of the operative process." The Italians hailed this operation with the greatest enthusiasm. Casati declared it to be an operation which will make an era in the annals of the science and will place the name of Loreta amongst those of the greatest and most illustrious surgeons of the age.

As far as I can ascertain digital divulsion of the pylorus has been performed six times with the following results: recoveries 3, deaths 2, doing well when heard from 1.

Statistical Summary of Cases of Digital Divulsion of the Pylorus.

No.	Operator.	Residence.	Date.	Sex.	Age.	Symptoms.	Diagnosis.	Duration of oper.	Result.	Reference.
1	Loreta	Bologna	1882 Sept. 14	M	47	Suffering for 20 years; pain and bloody vomiting.	Stenosis from ulcer	33 mins.	Cure	Journ. Am. Med. Assoc., 1883, vol. i. p. 28.
2	Loreta	Bologna	1882 Dec. 22	M	18	Suffering for 7 years; pain, vomiting, and emaciation.	Stenosis from ulcer	50 mins.	Cure	Raccoglitore Medico, 1883, p.147.
3	Giommi	Cesena	1883 Feb. 1	?	?	Patient in very bad condition.	Stenosis from ulcer	?	De'th in 12 hrs. coll'pse	Ibid.
4	Loreta	Bologna	1883 Mar. 17	M	46	Suffered 17 years with chronic gastritis, bloody vomiting, etc.	Stenosis from ulcer	28 mins	De'th in 36 hrs.	Ibid., 1883, p. 275.
5	Loreta	Bologna	1883 July 15	M	?	Suffered 3 years daily vomiting, gradually starving.	Stenosis from ulcer	20 mins.	Cure in 10 days	L'Independente, Aug. 15, 1883, p. 552.
6	Frattini	Venice	1884 June 9	?	?	?	Stenosis from ulcer	?	Doing well on 3d day	Gazetta degli Ospitali, June 15, 1884, p. 292.

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[1] Deutsche Med. Wochens., 1882, p. 381.

[2] Raccoglitore Medico, 1882, p. 81.

This does not profess to be a complete record of all the digital divulsions of the pylorus which have been performed, but they are all that I have been able to collect from the literature at my disposal. I have strong reasons for believing that a number of other cases have been operated on.

As yet the operation of digital divulsion of the pylorus has not extended beyond the land of its birth, Italy, but it does not seem to have attracted that emulation which it deserves.

The *technique* of the operation is thus described by Dr. Hubert:[1] The incision of the abdominal walls over the pyloric extremity of the stomach on the right side, parallel with the costal arch for a distance of five or six inches. The stomach was thus brought into the wound and an opening made near the pylorus, the index finger was then introduced into its cavity and gradually insinuated into the pyloric orifice, the index of the other hand was then entered by the side of the first and they were forcibly separated until a dilatation of three inches had been accomplished, and the pylorus was felt to yield. The stomach wound was united by the Apolito-Gély suture, and the abdomen closed in the usual manner. The length of time consumed in the operations of Loreta varied from 20 to 50 minutes, the average of the four being $32\frac{3}{4}$ minutes. The patients did not suffer from profound shocks, and were able to take nourishment in a short while.

Symptoms, etc.—The perusal of the histories of the cases recorded is replete with interest and information. The patients had been suffering for periods varying from three to twenty years with digestive disturbances, pain and vomiting of blood, until they were reduced to the very verge of starvation. The diagnosis in all the cases was cicatricial stenosis from ulcer. It is somewhat remarkable that so many cases of simple stenosis of the pylorus should have come under the notice of one man in such a short time, and, as stated by Dr. R. P. Harris in *The Medical News* (April 21, 1883), is probably due to the generally defective nourishment of the poorer classes of Italians.

Results.—The result of these cases is very gratifying; of six cases operated on three were entirely relieved of all distressing symptoms, and were able to eat and digest ordinary food almost at once. The first patient upon whom Loreta operated gained forty-six pounds in one month; and that the results gained are fairly lasting is authenticated by Dr. Guido Pedrazzoli[2] of the Bologna Hospital, who, writing concerning the first two cases nearly a year subsequently, says: "The cases of recovery are perfect. Two cases have proved fatal, that of Dr. Giommi from collapse in twelve hours, the patient having been in a wretched condition previously. Loreta's 3d case died in thirty-six hours, probably from exhaustion, as he rallied well after the operation. Frattini's case was doing well when reported three days after the operation." We have thus, of five cases in which the result is known, 3 recoveries and 2 deaths, or 60 per cent. of successes. Reasoning from analogy, it appears most rational to attempt the dilatation of these connective-tissue strictures. Who excises the rectum or urethra for a non-malignant stricture? Of course the matter is entirely different with regard to carcinoma of the pylorus, in which event forcible dilatation would probably lead to rupture of the diseased walls, hemorrhage or other disastrous consequences. The short duration of the operation of digital divulsion, the slight shock, the immediate and most astonishing improvement which takes place in those who recover, and the apparent permanence of the cure, notwithstanding the opinions which have been expressed that recontraction would occur, attest the excellence of this operation, and inevitably leads me to the conclusion that the medical profession is immensely indebted to Prof. Loreta for the development of this procedure, which as yet has not received the attention which it deserves.

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[1] Jour. Med. Chir. Pharmacol., Bruxelles, April, 1883. See translation in Jour. Am. Med. Assoc., vol. i. p. 23, July 14, 1883.

[2] Lancet, 1883, vol. ii. p. 213.

Casati[1] says digital divulsion presents three great advantages over resection: 1st. Its execution is easier. 2d. It is less dangerous. 3d. The conservation of a portion of the stomach which has certainly some office in the function of digestion which would be sacrificed by resection. The statistics amply prove the first of these propositions. The average duration of the four operations of divulsion was 32¾ minutes; the cases in which excision was performed for ulcer required 5, 2, and 1½ hours respectively; the length of the other cases not being known to me. That it is less dangerous is probable, as six excisions of the pylorus were followed by 50 per cent. of recoveries, six digital divulsions, if we include as a failure the case which was doing well on the third day when reported, by 50 per cent. of recoveries, or, if we exclude this, the average of recoveries in the five cases in which the termination is known is 60 per cent. The last proposition quoted scarcely holds a very great value, as the result of the extirpation of almost the whole stomach of a dog by Kaiser was perfect digestion and absolute increase in weight, so that when the animal was killed for experimental purposes in 1884,[2] eight years subsequent to the mutilation of his stomach, he was in much better condition than previous to the operation. Further, those patients who have recovered from pylorectomy have enjoyed good digestion, and have not appeared to suffer from the loss of the excised portion.[3]

CONCLUSIONS.—As in croup stenosis of the air-passages is the indication for tracheotomy, so stenosis of the pylorus is the indication for any operation upon this portion of the stomach in cancerous affections. If the patient simply suffers pain or distress, let him have opium freely enough to overcome it. There is no probability that an operation would effect a permanent cure, and the mortality is too great to perform it for a slight temporary benefit. Let such patients have anodynes.

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[1] Raccoglitore Medico, 1883, p. 81.

[2] Maurer, Arkiv für Klin. Chirurg., 1884, Bd. xxx. Heft 1.

[3] According to *Revue Médicale*, Prof. Loreta has practised digital divulsion of the pylorus five times with success. He says: "Resection of the pylorus for simple and cicatricial stenosis should be replaced by digital dilatation."—*Med. News*, Feb. 28, 1885.

When stenosis is present, as is indicated by obstinate vomiting, dilatation of the stomach, scanty stools, and marked emaciation, something must be done, or the patient will die of starvation. If the patient is young, with a considerable degree of strength, and the tumor circumscribed and not adherent to the surrounding organs, a resection may be performed, with however only a prospect of saving one-half of those submitted to it.

When, however, the patient is feeble, or aged, and there are adhesions to the pancreas or infiltration of the neighboring glands, resection ought not to be performed. In such cases gastro-enterostomy would effect all that could be expected frôm resection, with less immediate danger, and would be much more satisfactory than duodenostomy, or gastrostomy with a tube pushed through the stenosed orifice. In fact I do not think I would be far wrong in assuming that better results would follow gastro-enterostomy in all cases, though I hold it to be justifiable to perform pylorectomy in those very exceptional cases in which there are no adhesions or extended glandular involvement, and the strength of the patient is still fairly good.

For stenosis due to ulcer or to corrosive liquids which have been swallowed, whilst resection if successful is probably permanent in its effects, I think the results obtained by Loreta from digital divulsion demand our most earnest attention. In my opinion divulsion should be substituted for resection in all cases of simple cicatricial stenosis which are amenable to this treatment. I can readily imagine a condition in which the development of cicatricial tissue has gone to such an extent that digital divulsion would be impossible; in such cases pylorectomy remains, or what would be still better in some cases gastroenterostomy.

SUMMARY.—1st. In cancer of stomach not producing stenosis, give anodynes in quantities sufficient to relieve distress, and do not operate.

2d. Pylorectomy for carcinoma is followed by 76 per cent. mortality; hence it should only be very exceptionally performed—in those cases where, with marked stenosis, the pylorus is not adherent to the neighboring organs, and the patient is young and fairly strong.

3d. In other cases of carcinomatous stenosis, as only very temporary benefit can be obtained, perform gastro-enterostomy.

4th. In cicatricial stenosis perform digital divulsion, but, if this is impossible, owing to great thickening of the walls, resection in those who are well nourished, and gastro-enterostomy in the debilitated will both be followed by good results.

5th. In the opinion of the writer hemorrhage or perforation from ulcer or other cause than stenosis does not present indications for pylorectomy.

6th. Duodenostomy, gastrostomy for the passage of a tube, and complete gastrectomy should all be replaced by gastro-enterostomy.

201 W. BIDDLE ST., BALTIMORE, MD., Feb 9, 1885.